Moving data to Fermilab

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The problem

You create data files at Gran Sasso, how do you get them to Fermilab for use/archiving?

You could copy (scp?) files by hand every now and then.
Boring.

You could write a cron job to move files at certain times.
How do you monitor this? What happens when things go wrong?

You could write a fancy data movement system. It's fun!
Lots of devils in the details. This is a solved problem. Do you need to re-solve it too?

“File Transfer System”

A system for NOvA to archive NDOS raw detector, MC files, and log files to tape and disk. Will also be used to transfer raw files from Ash River to Fermilab.

Main function:

Files appear in directories. FTS notices and stores them, perhaps to multiple locations. Can also “merge” files (no longer necessary for tape). Automatic confirmation and deletion if desired

Highly configurable:

One system can watch many directories. Options can be based on file types (raw, log, MC)

Robust:

Integrated web based monitoring system
Confirmation (including size and CRC checks) and automated retries

Chain-able:

One FTS system can hand off files to another

Example: NOvA's current system

FTS status for novadaq-ctrl-datadisk-02.fnal.gov

Generated at 2012-06-21 01:06:32 CDT (refresh)

Summary

FTS: OK	FSS: OK	Stager: OK

Completed files:	21987
Failed transfers:	0
All error files:	63
Pending files:	96
New files:	0

- Recent completed transfers

Time	File name	Destination
raw		
2012-06-21 00:56:52 CDT	ndos_r00013924_s04_t02.raw	novadata:/nova/data/rawdata/NDOS/000139/13924/02
2012-06-21 00:56:51 CDT	ndos_r00013924_s04.raw	novadata:/nova/data/rawdata/NDOS/000139/13924/all
2012-06-20 23:56:51 CDT	ndos_r00013924_s03.raw	novadata:/nova/data/rawdata/NDOS/000139/13924/all
2012-06-20 23:56:50 CDT	ndos_r00013924_s03_t02.raw	novadata:/nova/data/rawdata/NDOS/000139/13924/02
2012-06-20 23:01:00 CDT	ndos_r00013924_s00.raw	/pnfs/nova/rawdata/NDOS/runs/000139/13924
2012-06-20 23:01:00 CDT	ndos_r00013924_s01_t02.raw	/pnfs/nova/rawdata/NDOS/runs/000139/13924
2012-06-20 23:01:00 CDT	ndos_r00013924_s01.raw	/pnfs/nova/rawdata/NDOS/runs/000139/13924
2012-06-20 23:00:30 CDT	ndos_r00013923_s00_t02.raw	/pnfs/nova/rawdata/NDOS/runs/000139/13923
2012-06-20 23:00:30 CDT	ndos_r00013924_s00_t02.raw	/pnfs/nova/rawdata/NDOS/runs/000139/13924
2012-06-20 23:00:30 CDT	ndos_r00013924_s02_t02.raw	/pnfs/nova/rawdata/NDOS/runs/000139/13924

Flexible configuration

- Configuration

File types

raw

Scan directory: /data2/NDOS
Scan interval: 10min
Will be merged; max size: 7.00GB; max age: 7dy
Transfer to: novadata:/nova/data/rawdata/NDOS/${Online.Runnumber/100[6]}/${Online.Runnumber}/${Online.Stream[2]}; /pnfs/nova/rawdata/NDOS/runs/${Online.Runnumber/100[6]}/${Online.Runn

merged-raw

Transfer to: /pnfs/nova/rawdata/NDOS/$year/$month

log

Scan directory: /daqlogs
Scan interval: 15min
Will be merged; max size: 6.00GB; max age: 7dy
Erase files after: 60dy

merged-log

Transfer to: /pnfs/nova/archived_logs/$year/$month

Example errors

- All errors

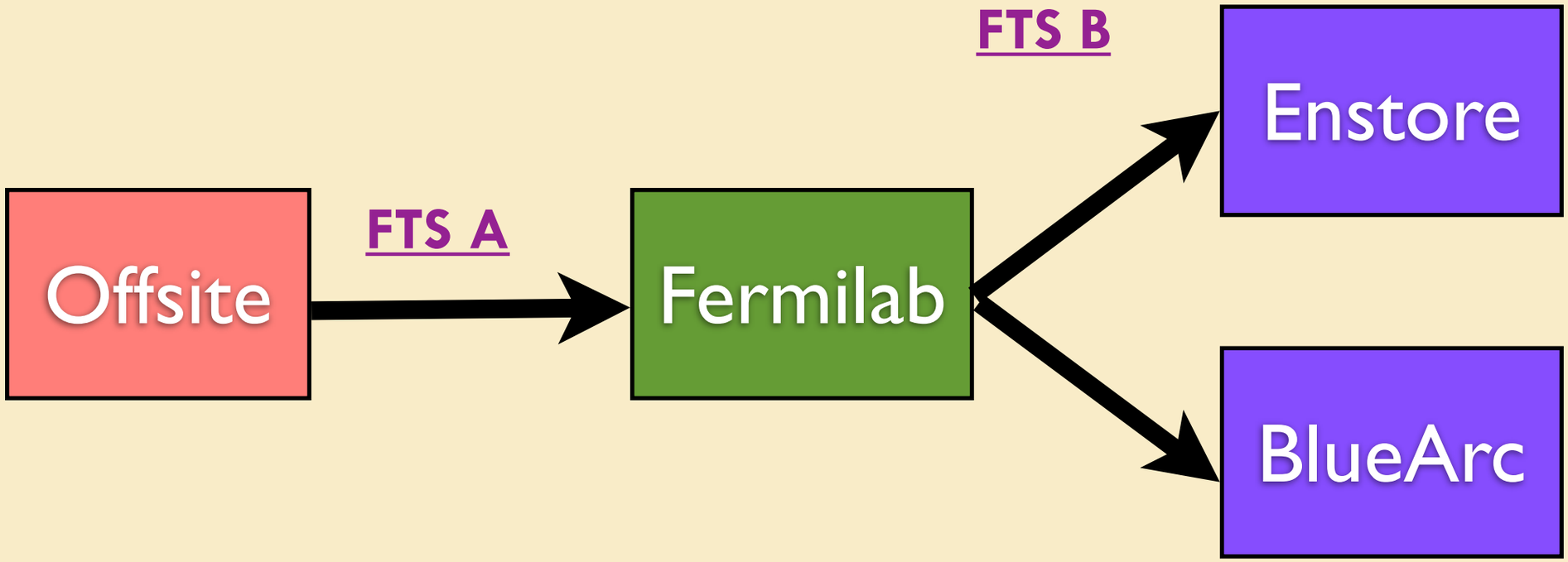
Time	File name	Type	Error message
2012-06-15 14:44:28 CDT	archiveEngine-startup.log	log	File size mismatch for /daqlogs/NDOS/CSSApplications/novadcs-ctrl-readout-02/archiveEngine-startup.log: expected 3139437, got 825444
2012-06-15 14:44:28 CDT	activemq.log	log	File size mismatch for /daqlogs/NDOS/DCSMessaging/novadcs-ctrl-master/activemq.log: expected 94576, got 77470
2012-06-15 14:44:23 CDT	rcServer_20120608_150051.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rcServer_20120608_150051.log: expected 61, got 484
2012-06-15 14:43:57 CDT	rcClient_20120406_120904.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rcClient_20120406_120904.log: expected 93, got 319
2012-06-15 14:43:57 CDT	rmServer_20111202_103431.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rmServer_20111202_103431.log: expected 3230, got 6273
2012-06-15 14:43:57 CDT	rsrc_20111202_103431.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rsrc_20111202_103431.log: expected 160, got 298
2012-06-15 14:43:57 CDT	rmServer_20111021_163850.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rmServer_20111021_163850.log: expected 3203, got 5982
2012-06-15 14:43:57 CDT	rsrc_20111021_163850.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rsrc_20111021_163850.log: expected 170, got 323
2012-06-15 14:43:57 CDT	rsrc_20110812_171837.log	log	File size mismatch for /daqlogs/NDOS/Partition0/RunControl/novadaq-ctrl-master/rsrc_20110812_171837.log: expected 63, got 105

2012-06-15 14:42:49 CDT	ndos_r00013876_s00.raw	raw	Running command MetaDataRunTool /data2/NDOS/ndos_r00013876_s00.raw failed with exit code 255 stdout (Total 134 bytes): /data2/NDOS/ndos_r00013876_s00.raw /data2/NDOS/ndos_r00013876_s00.raw Empty File. Returned size: 0 Failed to open file for reading:
2012-06-15 14:42:47 CDT	ndos_r00013868_s00.raw	raw	Running command MetaDataRunTool /data2/NDOS/ndos_r00013868_s00.raw failed with exit code 255 stdout (Total 134 bytes): /data2/NDOS/ndos_r00013868_s00.raw /data2/NDOS/ndos_r00013868_s00.raw Empty File. Returned size: 0 Failed to open file for reading:
2012-06-15 14:42:02 CDT	ndos_r00013800_s00.raw	raw	Running command MetaDataRunTool /data2/NDOS/ndos_r00013800_s00.raw failed with exit code 255 stdout (Total 134 bytes): /data2/NDOS/ndos_r00013800_s00.raw /data2/NDOS/ndos_r00013800_s00.raw Empty File. Returned size: 0 Failed to open file for reading:

FTS “Forwarding”

Necessary since one cannot store files to enstore (tape) from offsite

One FTS moves files from offsite to Fermilab. Second FTS then moves files to tape



Many transfer protocols available

cp, scp
(Local copying)

***gridftp* with kerberos or grid certificates**
(Copying from remote sites)

srmcp
(Copying to a grid storage element)

Current status

Running at NOvA (NDOS) for many months

Plan to incorporate into Minerva production

Introduce to other experiments

FTS lives in a larger system: SAM

SAM is a comprehensive Data Management system developed for Run II and used by intensity frontier experiments

File cataloging with metadata

Dataset definition via metadata queries

Replica catalog

Project tracking

Cache management

Grid compatible

Integration with your offline framework

SAM requirements

An Oracle database hosted by Fermilab DBAs and DB servers

A SAM “station” [manages all file transfers]

FTS software

SCD/REX will help set all this up

SAM lives within a bigger context (FabrIc for Frontier Experiments)

FIFE will include architecture, design, services and support for

Grid submission to dedicated and opportunistic resources and user-friendly monitoring of submitted jobs.

Data management and handling with co-scheduling of data and job services and integrated into the art analysis framework.

Database and dataset applications such as beam monitoring, conditions, and hardware

Collaborative tools such as an electronic control room logbook and shift scheduler

Collaborations with experiments to build the integrated solutions.
FIFE will be based on common toolsets where ever possible to increase flexibility, provide for efficient evolution, and reduce the maintenance load.

Summary

You could use FTS to automatically and robustly move files from Gran Sasso to Fermilab

Efficient and robust

The larger system (SAM) may have benefits for you as well

SCP/REX aims to provide a comprehensive suit of services (FIFE) to experiments. FTS is a piece